

Amendments to the Claims:

Following is a complete listing of the claims pending in the application, as amended:

1. (Currently Amended) A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer, the invocation request identifying the attribute whose value is to be provided; and

in response to receiving the invocation request, providing a value for the identified attribute and an uncertainty level for the identified attribute to the requesting attribute consumer.

2. (Original) The method of claim 1 wherein the invocation request is a function call.

3. (Original) The method of claim 1 wherein the invocation request is a procedure.

4. (Original) The method of claim 1 wherein the invocation request is an invocation message.

5. (Original) The method of claim 1 wherein a value of the identified attribute is stored, and wherein the stored value is provided to the requesting attribute consumer.

6. (Currently Amended) The method of claim 1 wherein the identified attribute is associated with an attribute source, and wherein the method further comprises obtaining a value of the identified attribute from the attribute source with which the identified attribute is associated, and wherein the value of the attribute

obtained from the attribute source with which the identified attribute is provided to the requesting attribute consumer.

7. (Original) The method of claim 1 further comprising, in addition to providing a value for the identified attribute to the requesting attribute consumer, providing units of the value for the identified attribute.

8. (Canceled.)

9. (Original) The method of claim 1 further comprising, in addition to providing a value for the identified attribute to the requesting attribute consumer, providing a timestamp for the identified attribute.

10. (Original) The method of claim 1 wherein the identified attribute is information reflecting an aspect of the computing device.

11. (Original) The method of claim 10 wherein the computing device has a visual output device, and wherein the identified attribute is information about the availability of the visual output device.

12. (Original) The method of claim 1 wherein the computing device is present in an environment, and wherein the identified attribute is information reflecting an aspect of the environment.

13. (Currently Amended) ~~The method of claim 12~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, the identified attribute being information reflecting an aspect of an environment in which the computing device is present such that wherein

the environment has a temperature; and ~~wherein~~ the identified attribute is the temperature of the environment; and -

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer.

14. (Original) The method of claim 1 wherein the computing device has a user, and wherein the identified attribute is information reflecting an aspect of the user.

15. (Currently Amended) ~~The method of claim 14~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, the identified attribute being information reflecting an aspect of a user of the computing device such that ~~wherein~~ the user has a blood pressure; and the identified attribute is the blood pressure of the user; and -

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer.

16. (Original) The method of claim 1 wherein one or more applications are executing on the computing device, and wherein the identified attribute is information reflecting an aspect of an executing application.

17. (Original) The method of claim 16 wherein an electronic messaging application is among the applications executing on the computing device, and wherein the identified attribute indicates whether new messages have been received by the electronic messaging application.

18. (Original) The method of claim 1 wherein the computing device is outside a selected remote environment, and wherein the identified attribute is information reflecting an aspect of the remote environment.

19. (Currently Amended) ~~The method of claim 18~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, the identified attribute being information reflecting an aspect of a selected remote environment of which the computing device is outside such that wherein the environment has a temperature, and wherein the identified attribute is the temperature of the remote environment; and

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer.

20. (Original) The method of claim 1 wherein the computing device has a user, and wherein the identified attribute is information reflecting an aspect of a selected person other than the user.

21. (Original) The method of claim 20 wherein the selected person has a location, and wherein the identified attribute is the location of the selected person.

22. (Original) The method of claim 1 wherein the identified attribute is information reflecting an aspect of an identified person.

23. (Currently Amended) ~~The method of claim 22~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, the identified attribute being information reflecting an aspect of an identified person such that wherein the identified person has a temperature, and wherein the identified attribute is the temperature of the identified person; and

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer.

24. (Currently Amended) ~~The method of claim 1~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer, the invocation request identifying the attribute whose value is to be provided and wherein the invocation request further specifyingies a maximum age for the attribute value; and

in response to receiving the invocation request, providing to the requesting attribute consumer a value for the identified attribute that wherein the value provided to the requesting attribute consumer has an age that is no older than the specified maximum age.

25. (Currently Amended) ~~The method of claim 1~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, wherein the identified attribute havings a source such that, and wherein a value of the identified attribute previously obtained from the source of the identified attribute is cached with an indication of the an age of the previously-obtained value of the identified attribute; and,

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer by, and wherein the method further comprises, in response to receiving the invocation request:

determining whether the age of the previously-obtained value of the identified attribute exceeds the specified maximum age;

if the age of the previously-obtained value of the identified attribute does not exceed the specified maximum age, providing the previously-obtained value of the identified attribute to the requesting attribute consumer; and

if the age of the previously-obtained value of the identified attribute exceeds the specified maximum age:

obtaining a new value of the identified attribute from the source of the identified attribute, and

providing the new value of the identified attribute to the requesting attribute consumer.

26. (Currently Amended) The method of claim 25 ~~34~~ further comprising caching the new value of the identified attribute.

27. (Currently Amended) ~~The method of claim 1~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, wherein the identified attribute having a source such that, and wherein a value of the identified attribute previously obtained from the source of the identified attribute is cached with an indication of the age of the previously-obtained value of the identified attribute; and,

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer by, and wherein the method further comprises, in response to receiving the invocation request:

determining whether the age of the previously-obtained value of the identified attribute exceeds the specified maximum age;

if the age of the previously-obtained value of the identified attribute does not exceed the specified maximum age, providing the previously-obtained value of the identified attribute to the requesting attribute consumer; and

if the age of the previously-obtained value of the identified attribute exceeds the specified maximum age:

obtaining a new value of the identified attribute from the source of the identified attribute,

determining that the new value of the identified attribute exceeds the specified maximum age, and

in response to determining that the new value of the identified attribute exceeds the specified maximum age, generating an error condition indicating that the source is unable to satisfy the specified maximum age.

28. (Original) The method of claim 1 wherein a value of the identified attribute is available from each of a plurality of sources, and wherein the invocation request further specifies one of the plurality of sources from which a value of the identified attribute is available, and wherein the value of the identified attribute provided to the requesting attribute consumer is from the specified source.

29. (Original) The method of claim 1 wherein a value of the identified attribute is available from each of a plurality of sources, and wherein the invocation request further specifies to provide a value of the identified attribute from each of the sources from which a value of the identified attribute is available, and wherein a value of the identified attribute from each of the sources from which a value of the identified attribute is available is provided to the requesting attribute consumer.

30. (Original) The method of claim 1 wherein a value of the identified attribute is available from each of a plurality of sources, and wherein the value of the identified attribute provided to the requesting attribute consumer is determined based upon the values of the identified attribute available from the plurality of sources.

31. (Original) The method of claim 30, further comprising caching the value of the identified attribute provided to the requesting attribute consumer.

32. (Original) The method of claim 1 wherein a plurality of values of the identified attribute are available from different sources, and wherein the invocation request further specifies to select one of the plurality of available values of the identified

attribute to provide, and wherein the value of the identified attribute provided to the requesting attribute consumer is selected from the plurality of available values of the identified attribute.

33. (Original) The method of claim 1 wherein a plurality of values of the identified attribute are available from different sources, and wherein the invocation request further specifies to determine a value of the identified attribute to provide that is based upon the plurality of available values of the identified attribute but different than each of the plurality of available values of the identified attribute, and wherein the value of the identified attribute provided to the requesting attribute consumer is based upon the plurality of available values of the identified attribute but different from each of the plurality of available values of the identified attribute.

34. (Original) The method of claim 1 wherein a plurality of values of the identified attribute are available from different sources, and wherein the invocation request further specifies to determine, from the plurality of available values of the identified attribute, one value of the identified attribute to provide, and wherein the value of the identified attribute provided to the requesting attribute consumer is determined from the plurality of available values of the identified attribute.

35. (Original) The method of claim 34 wherein the invocation request further specifies a basis for determining, from the plurality of available values of the identified attribute, one value of the identified attribute to provide, and wherein the value of the identified attribute provided to the requesting attribute consumer is determined from the plurality of available values of the identified attribute using the specified basis.

36. (Currently Amended) ~~The method of claim 35~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute

whose value is to be provided, the invocation request further specifying a basis for determining one of a plurality of values of the identified attribute that are available from different sources to provide such that wherein the invocation request further specifies selecting the oldest available value of the identified attribute is to be selected; and,

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer that is determined from the plurality of available values of the identified attribute using the specified basis such that the provided value and wherein the value of the identified attribute provided to the requesting attribute consumer is the oldest available value of the identified attribute.

37. (Currently Amended) ~~The method of claim 35~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, the invocation request further specifying a basis for determining one of a plurality of values of the identified attribute that are available from different sources to provide such that wherein the invocation request further specifies selecting the newest available value of the identified attribute is to be selected; and,

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer that is determined from the plurality of available values of the identified attribute using the specified basis such that the provided value and wherein the value of the identified attribute provided to the requesting attribute consumer is the newest available value of the identified attribute.

38. (Original) The method of claim 35 wherein the available values of the identified attribute are each requested and received from a different source, and wherein the invocation request further specifies selecting the first-received available value of the identified attribute, and wherein the value of the identified attribute provided to the requesting attribute consumer is the first-received available value of the identified attribute.

39. (Currently Amended) ~~The method of claim 35~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, the invocation request further specifying a basis for determining one of a plurality of values of the identified attribute that are available from different sources to provide such that wherein each available value of the identified attribute has an uncertainty level, and wherein the invocation request further specifies selecting the available value of the identified attribute having the a lowest uncertainty level is to be selected; and,

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer that is determined from the plurality of available values of the identified attribute using the specified basis such that the provided value and wherein the value of the identified attribute provided to the requesting attribute consumer is the available value of the identified attribute having the lowest uncertainty level.

40. (Currently Amended) ~~The method of claim 35~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, the invocation request further specifying a basis for determining wherein the invocation request further specifies determining a value of the identified attribute to provide that is the an average of the available values of the identified attribute a plurality of values of the identified attribute that are available from different sources; and,

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer that is determined from the plurality of available values of the identified attribute using the specified basis such that the provided value and wherein the value of the identified attribute provided to the

~~requesting attribute consumer~~ is the average of the available values of the identified attribute.

41. (Currently Amended) ~~The method of claim 35~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, wherein each of the available values of the identified attribute has a plurality of values of the identified attribute that are available from different sources having an uncertainty level, the invocation request further specifying a basis for determining a value of the identified attribute to provide based at least in part on uncertainty level; and

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer that is determined from the plurality of available values of the identified attribute using the specified basis such that the provided value and wherein the value of the identified attribute provided to the requesting attribute consumer is the average of the available values of the identified attribute, weighted by their uncertainty levels.

42. (Currently Amended) ~~The method of claim 35~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, wherein each of the available values of the identified attribute has a plurality of values of the identified attribute that are available from different sources having an age, the invocation request further specifying a basis for determining a value of the identified attribute to provide based at least in part on age; and

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer that is determined from the plurality of available values of the identified attribute using the specified basis such that

~~the provided value and wherein the value of the identified attribute provided to the requesting attribute consumer is the average of the available values of the identified attribute, weighted by their ages.~~

43. (Currently Amended) ~~The method of claim 35~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, the invocation request further specifying a basis for determining one of a plurality of values of the identified attribute that are available from different sources to provide such that wherein the invocation request further specifies selecting the available value of the identified attribute that occurs the largest number of times among the available values of the identified attribute is to be selected; and,

in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer that is determined from the plurality of available values of the identified attribute using the specified basis such that
~~the provided value and wherein the value of the identified attribute provided to the requesting attribute consumer is the available value of the identified attribute that occurs the largest number of times among the available values of the identified attribute.~~

44. (Original) The method of claim 35 wherein the invocation request further specifies soliciting selection by a user of one of the available values of the identified attribute, and wherein the value of the identified attribute provided to the requesting attribute consumer is an available value of the identified attribute selected by the user.

45. (Currently Amended) ~~The method of claim 35~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer and identifying the attribute whose value is to be provided, wherein each available value of the identified attribute

~~has of a plurality of values of the identified attribute that are available from different sources having an uncertainty level and an effective time, the invocation request further specifying a basis for and wherein the invocation request further specifies selecting an available value of the identified attribute based upon a function of the uncertainty level and effective time of each; and;~~

~~in response to receiving the invocation request, providing a value for the identified attribute to the requesting attribute consumer that is determined from the plurality of available values of the identified attribute using the specified basis such that the provided value and wherein the value of the identified attribute provided to the requesting attribute consumer is selected from the available values of the identified attribute based upon the function of the uncertainty level and effective time of each.~~

46. (Original) The method of claim 1 wherein the invocation request is received by a context characterization module, and wherein the context characterization module has an attribute under its control, and wherein the invocation request identifies the attribute under the control of the characterization module, and wherein the attribute whose value is provided to the requesting attribute consumer is the attribute under the control of the characterization module.

47. (Original) The method of claim 1 further comprising, before the invocation request to provide an attribute value is received, receiving from the attribute consumer an invocation request to register the attribute consumer.

48. (Original) The method of claim 47 wherein the invocation request to register an attribute consumer indicates that the requesting attribute consumer reserves an opportunity to later request provision of a value of the identified attribute, the method further comprising associating with the identified attribute an indication that the requesting attribute consumer is dependent on the identified attribute.

49. (Original) The method of claim 1 further comprising, before the invocation request to provide an attribute value is received, receiving an invocation request to register an attribute source for the identified attribute, and wherein the method further comprises obtaining a value of the identified attribute from the attribute source with which the identified attribute is associated, and wherein the value of the attribute obtained from the attribute source with which the identified attribute is provided to the requesting attribute consumer.

50. (Currently Amended) A computing device for exchanging context attributes, comprising:

an invocation request receiver that receives an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer, the invocation request identifying the attribute whose value is to be provided; and

an attribute value provider that provides a value for the identified attribute and an uncertainty level for the identified attribute to the requesting attribute consumer in response to receipt of the invocation request by the invocation request receiver.

51. (Original) The computing device of claim 50 wherein the computing device is a mobile computing device.

52. (Original) The computing device of claim 50 wherein the computing device is a wearable computing device worn on the body of a human user.

53. (Original) The computing device of claim 50 further comprising an attribute value memory that contains a value of the identified attribute, wherein the attribute value contained in the attribute value memory is provided to the requesting attribute consumer by the attribute value provider.

54. (Original) The computing device of claim 50 wherein the identified attribute is associated with an attribute source, the computing device further comprising an attribute procurement subsystem that obtains a value of the identified attribute from the attribute source with which the identified attribute is associated, and wherein the value of the attribute obtained from the attribute source with which the identified attribute is provided to the requesting attribute consumer by the attribute value provider.

55. (Currently Amended) ~~The computing device of claim 50~~ A computing device for exchanging context attributes, comprising:

an invocation request receiver that receives an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer, the invocation request identifying the attribute whose value is to be provided, wherein the identified attribute having a source, and wherein a value of the identified attribute previously obtained from the source of the identified attribute is being cached with an indication of the age of the previously-obtained value of the identified attribute;

~~and wherein the computing device further comprises an age determination subsystem that determines whether the age of the previously-obtained value of the identified attribute exceeds the~~ a specified maximum age in response to receipt of the invocation request by the invocation request receiver; and

~~and wherein the~~ an attribute value provider that provides a value for the identified attribute to the requesting attribute consumer in response to receipt of the invocation request by the invocation request receiver in such a manner that the previously-obtained value of the identified attribute to the requesting attribute consumer is provided if the ~~its~~ age of the previously-obtained value of the identified attribute does not exceed the specified maximum age, and in such a manner that obtains a new value of the identified attribute that is obtained from the source of the identified attribute and provides the new value of the identified attribute to the requesting attribute consumer is provided if the age of the previously-obtained value of the identified attribute exceeds the specified maximum age.

56. (Original) The computing device of claim 50 wherein a value of the identified attribute is available from each of a plurality of sources, and wherein the invocation request further specifies one of the plurality of sources from which a value of the identified attribute is available, and wherein the value of the identified attribute provided to the requesting attribute consumer by the attribute value provider is from the specified source.

57. (Original) The computing device of claim 50 wherein a value of the identified attribute is available from each of a plurality of sources, and wherein the invocation request further specifies to provide a value of the identified attribute from each of the sources from which a value of the identified attribute is available, and wherein a value of the identified attribute from each of the sources from which a value of the identified attribute is available is provided to the requesting attribute consumer by the attribute value provider.

58. (Original) The computing device of claim 50 wherein a value of the identified attribute is available from each of a plurality of sources, and wherein the value of the identified attribute provided to the requesting attribute consumer is determined based upon the plurality of values of the identified attribute available from different sources.

59. (Original) The computing device of claim 50 wherein a plurality of values of the identified attribute are available from different sources, and wherein the value of the identified attribute provided to the requesting attribute consumer by the attribute value provider is selected from the plurality of available values of the identified attribute.

60. (Original) The computing device of claim 50 wherein a plurality of values of the identified attribute are available from different sources, and wherein the value of the identified attribute provided to the requesting attribute consumer by the attribute

value provider is based upon the plurality of available values of the identified attribute but different from each of the plurality of available values of the identified attribute.

61. (Currently Amended) A computer-readable medium whose contents cause a computing device to exchange context attributes, by performing a method comprising:

receiving an invocation request to provide an attribute value, the invocation request being generated by a requesting attribute consumer, the invocation request identifying the attribute whose value is to be provided; and

in response to receiving the invocation request, providing a value for the identified attribute and an uncertainty level for the identified attribute to the requesting attribute consumer.

62-72. (Canceled.)

73. (Currently Amended) A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to register an attribute, the invocation request being generated by an attribute source, the invocation request identifying the attribute to be registered and further specifying a manner of invoking the attribute source to obtain the identified attribute from the attribute source; and

in response to receiving the invocation request, generating an indication that the identified attribute can be obtained from the attribute source, the generated indication including an indication of the specified manner of invoking the attribute source to obtain the identified attribute from the attribute source; -

invoking the attribute source in the specified manner to obtain the identified attribute from the attribute source; and

in response to invocation of the attribute source, receiving the identified attribute from the attribute source so as to receive a value of the attribute and an indication of the time at which the value of the attribute is most accurate.

74-75. (Canceled.)

76. (Currently Amended) The method of claim ~~75-73~~ wherein invoking the attribute source to obtain the identified attribute from the attribute source includes an identification of the attribute.

77. (Currently Amended) ~~The method of claim 75~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to register an attribute, the invocation request being generated by an attribute source, the invocation request identifying the attribute to be registered and further specifying a manner of invoking the attribute source to obtain the identified attribute from the attribute source;

in response to receiving the invocation request, generating an indication that the identified attribute can be obtained from the attribute source, the generated indication including an indication of the specified manner of invoking the attribute source to obtain the identified attribute from the attribute source; and

invoking the attribute source in the specified manner to obtain the identified attribute from the attribute source, wherein ~~the invoking the attribute source to obtain the identified attribute from the attribute source~~ includes an indication of a maximum time in which the attribute source is expected to supply the identified attribute.

78-79. (Canceled.)

80. (Currently Amended) ~~The method of claim 79~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to register an attribute, the invocation request being generated by an attribute source, the invocation request identifying the attribute to be registered and further specifying a manner of invoking the attribute source to obtain the identified attribute from the attribute source;

in response to receiving the invocation request, generating an indication that the identified attribute can be obtained from the attribute source, the generated indication including an indication of the specified manner of invoking the attribute source to obtain the identified attribute from the attribute source; and

invoking the attribute source in the specified manner to obtain the identified attribute from the attribute source;

in response to invocation of the attribute source, receiving the identified attribute from the attribute source so as to receive a value of the attribute and ~~wherein receiving the identified attribute from the attribute source includes an indication of the level of uncertainty of the value of the attribute.~~

81. (Canceled.)

82. (Currently Amended) ~~The method of claim 79~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to register an attribute, the invocation request being generated by an attribute source, the invocation request identifying the attribute to be registered and further specifying a manner of invoking the attribute source to obtain the identified attribute from the attribute source;

in response to receiving the invocation request, generating an indication that the identified attribute can be obtained from the attribute source, the generated indication including an indication of the specified manner of invoking the attribute source to obtain the identified attribute from the attribute source; and

invoking the attribute source in the specified manner to obtain the identified attribute from the attribute source;

in response to invocation of the attribute source, receiving the identified attribute from the attribute source so as to receive a value of the attribute and ~~wherein receiving the identified attribute from the attribute source includes an indication of the units in which the value of the attribute is expressed.~~

83. (Currently Amended) ~~The method of claim 79~~ A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to register an attribute, the invocation request being generated by an attribute source, the invocation request identifying the attribute to be registered and further specifying a manner of invoking the attribute source to obtain the identified attribute from the attribute source;

in response to receiving the invocation request, generating an indication that the identified attribute can be obtained from the attribute source, the generated indication including an indication of the specified manner of invoking the attribute source to obtain the identified attribute from the attribute source; and

invoking the attribute source in the specified manner to obtain the identified attribute from the attribute source;

in response to invocation of the attribute source, receiving the identified attribute from the attribute source so as to receive a value of the attribute and ~~wherein receiving the identified attribute from the attribute source includes an indication of the~~ a ~~format in which the value of the attribute is expressed.~~

84. (Currently Amended) The method of claim ~~74-73~~ further comprising:

receiving an invocation request to provide an attribute value, the invocation request to provide an attribute value identifying the attribute identified by the invocation request to register an attribute, the invocation request to provide an attribute value being generated by a requesting attribute consumer; and

in response to receiving the invocation request to provide an attribute value:

using the generated indication of the specified manner of invoking the attribute source to obtain the identified attribute from the attribute source to invoke the attribute source to obtain the identified attribute from the attribute source, and

providing the attribute value obtained from the attribute source to the requesting attribute consumer.

85. (Original) The method of claim 73, wherein the invocation request further specifies a name of the attribute, and wherein the generated indication that the

identified attribute can be obtained from the attribute source includes an indication of the specified name of the attribute.

86. (Original) The method of claim 73, wherein the invocation request further specifies a name of the attribute source, and wherein the generated indication that the identified attribute can be obtained from the attribute source includes an indication of the specified name of the attribute source.

87. (Original) The method of claim 73, wherein the invocation request further specifies a data type of the attribute, and wherein the generated indication that the identified attribute can be obtained from the attribute source includes an indication of the specified data type of the attribute.

88. (Original) The method of claim 73, wherein the invocation request further specifies an indication of a format of the attribute, and wherein the generated indication that the identified attribute can be obtained from the attribute source includes an indication of the specified format indication of the attribute.

89. (Currently Amended) A computer-readable medium whose contents cause a computing device to exchange context attributes, by performing a method comprising:

receiving an invocation request to register an attribute, the invocation request being generated by an attribute source, the invocation request identifying the attribute to be registered and further specifying a manner of invoking the attribute source to obtain the identified attribute from the attribute source; and

in response to receiving the invocation request, generating an indication that the identified attribute can be obtained from the attribute source, the generated indication including an indication of the specified manner of invoking the attribute source to obtain the identified attribute from the attribute source;

invoking the attribute source in the specified manner to obtain the identified attribute from the attribute source; and

in response to invocation of the attribute source, receiving the identified attribute from the attribute source so as to receive a value of the attribute and an indication of the time at which the value of the attribute is most accurate.

90-91. (Canceled.)

92. (Currently Amended) The computer-readable medium of claim ~~91~~89 wherein invoking the attribute source to obtain the identified attribute from the attribute source includes an identification of the attribute.

93. (Currently Amended) The computer-readable medium of claim ~~90~~89 wherein the contents of the computer-readable medium further cause the computing device to:

receive an invocation request to provide an attribute value, the invocation request to provide an attribute value identifying the attribute identified by the invocation request to register an attribute, the invocation request to provide an attribute value being generated by a requesting attribute consumer; and

in response to receiving the invocation request to provide an attribute value:

_____ using the generated indication of the specified manner of invoking the attribute source to obtain the identified attribute from the attribute source to invoke the attribute source to obtain the identified attribute from the attribute source, and

_____ providing the attribute value obtained from the attribute source to the requesting attribute consumer.

94-97. (Canceled.)

98. (Original) A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to create a condition based on an attribute, the invocation request identifying the attribute on which the condition is based, the invocation request specifying a test to perform on the identified attribute; and

in response to receiving the invocation request, generating an indication of the condition, the generated indication identifying the attribute identified by the invocation request and indicating the specified test.

99. (Original) The method of claim 98 wherein the invocation request further specifies a name of the condition, and wherein the generated indication of the condition further indicates the specified condition name.

100. (Currently Amended) The method of claim 99 further comprising:

receiving an invocation request to evaluate a condition, the invocation request to evaluate a condition being generated by a requesting condition consumer, the invocation request to evaluate a condition specifying the condition name specified by the invocation request to create a condition; and

in response to receiving the invocation request to evaluate a condition:

_____using the generated indication of the condition to evaluate the condition based upon the attribute, and

_____providing to the requesting condition consumer an indication of the value of the condition as evaluated.

101. (Original) A method in a computing device for exchanging context attributes, comprising:

receiving an invocation request to create a condition monitor based on a condition, the invocation request identifying the condition on which the condition monitor is based, the invocation request specifying a test to perform on the identified condition monitor, the invocation request being generated by a requesting condition monitor consumer; and

in response to receiving the invocation request, generating an indication of the condition monitor, the generated indication identifying the condition identified by the invocation request and indicating the specified test.

102. (Original) The method of claim 100 further comprising:
at a time after receiving the invocation request, determining that the specified test has been satisfied; and
in response to determining that the specified test has been satisfied, notifying the requesting condition monitor consumer that the specified test has been satisfied.

103. (Original) The method of claim 100 wherein the invocation request further specifies a frequency with which the specified test is to be evaluated, and wherein the method further comprises reiteratively evaluating the specified test at substantially the specified frequency to determine whether the specified test has been satisfied

104. (Original) The method of claim 100 wherein the identified condition may transition between values of true and false, and wherein the specified test is either (1) that the identified condition transitions from the value false to the value true, (2) that the identified condition transitions from the value true to the value false, or (3) that the identified condition transitions either from the value false to the value true or from the value true to the value false.

105. (Original) The method of claim 100 wherein the invocation request further specifies a manner of invoking the requesting condition monitor consumer to notify the requesting condition monitor consumer that the specified test has been satisfied, and wherein the generated indication of the condition monitor includes an indication of the specified manner of invoking the requesting condition monitor consumer to notify the requesting condition monitor consumer that the specified test has been satisfied.

106. (Original) The method of claim 100 wherein the invocation request further specifies a name of the condition monitor, and wherein the generated indication of the condition further indicates the specified condition monitor name.

107. (Original) The method of claim 106 further comprising:

after receiving an invocation request to create a condition monitor, receiving an invocation request to suspend the operation of a condition monitor, the invocation request to suspend the operation of the condition monitor specifying the name of the condition monitor specified by the invocation request to create a condition monitor; and

in response to receiving the invocation request to suspend the operation of a condition monitor, modifying the indication of the condition monitor to indicate that operation of the condition monitor is suspended.

108. (Original) The method of claim 107, further comprising:

after receiving an invocation request to suspend the operation of a condition monitor, receiving an invocation request to resume the operation of a condition monitor, the invocation request to resume the operation of a condition monitor specifying the name of the condition monitor specified by the invocation request to create a condition monitor; and

in response to receiving the invocation request to suspend the operation of a condition monitor, modifying the indication of the condition monitor to indicate that operation of the condition monitor is not suspended.

109. (Original) The method of claim 108, further comprising:

during the period after receiving an invocation request to create a condition monitor and before receiving an invocation request to suspend the operation of a condition monitor, periodically evaluating the specified test;

during the period after receiving an invocation request to suspend the operation of a condition monitor and before receiving an invocation request to resume the operation of a condition monitor, omitting to evaluate the specified test; and

after receiving an invocation request to resume the operation of a condition monitor, periodically evaluating the specified test.

110-118. (Canceled.)

119. (Original) One or more computer memories collectively containing a context attribute condition data structure, the data structure comprising a plurality of entries, each entry corresponding to a condition based upon an attribute and containing:

information identifying the attribute upon which the condition is based; and

information specifying the test to be performed on the identified attribute in order to evaluation the condition,

such that the data structure may be used to evaluate the conditions to which its entries correspond.

120. (Original) The computer memories of claim 119 wherein each entry further contains an indication of a name of the corresponding condition, such that the contents of the data structure may be used to evaluate a condition having a particular name.

121. (Original) One or more computer memories collectively containing a context attribute condition monitor data structure, the data structure comprising a plurality of entries, each entry corresponding to a condition monitor based upon condition and containing:

information identifying the condition upon which the condition monitor is based; and

information specifying the test to be performed on the identified condition in order to determine whether the condition monitor has been triggered, such that the data structure may be used to determine whether the conditions monitors to which its entries correspond have been triggered.

122. (Original) The computer memories of claim 121 wherein each entry further specifies a frequency at which the corresponding condition monitor is to be evaluated to determine whether the condition monitor has been triggered, such that the contents of the data structure may be used to evaluate the condition monitors to which its rows correspond each at the frequency specified for it.

123. (Original) The computer memories of claim 121 wherein each entry further contains an indication of whether operation of the corresponding condition monitor is suspended, such that the contents of the data structure may be used to determine which of the condition monitors to which its rows correspond need not be evaluated.

124. (Original) The method of claim 1, further comprising the step of, in response to receiving the invocation request, providing a name and a value of a property associated with the identified attribute to the requesting attribute consumer.

125. (Original) The method of claim 6, further comprising obtaining a value of a property associated with the identified attribute from the attribute source with which the identified attribute is associated.

126. (Original) The method of claim 125, further comprising providing the obtained associated property value to the requesting attribute consumer.

127. (Original) The method of claim 125, wherein the obtained property is security information associated with the identified attribute, further comprising using the security information to determine whether to provide a value for the identified attribute to the requesting attribute consumer.

128-130. (Canceled.)

131. (New) The method of claim 24 wherein the invocation request is a function call.

132. (New) The method of claim 24 wherein the invocation request is a procedure.

133. (New) The method of claim 24 wherein the invocation request is an invocation message.

134. (New) The method of claim 24 wherein a value of the identified attribute is stored, and wherein the provided value is the stored value.

135. (New) The method of claim 24 wherein the identified attribute is associated with an attribute source, and wherein the method further comprises obtaining a value of the identified attribute from that attribute source, and wherein the provided value is the obtained value from the attribute source.

136. (New) The method of claim 24 further comprising, in addition to providing a value for the identified attribute to the requesting attribute consumer, providing units of the value for the identified attribute.

137. (New) The method of claim 24 further comprising, in addition to providing a value for the identified attribute to the requesting attribute consumer, providing a timestamp for the identified attribute.

138. (New) The method of claim 24 wherein the identified attribute reflects an aspect of the computing device.

139. (New) The method of claim 138 wherein the computing device has a visual output device, and wherein the identified attribute reflects availability of the visual output device.

140. (New) The method of claim 24 wherein the computing device is present in an environment, and wherein the identified attribute reflects an aspect of the environment.

141. (New) The method of claim 24 wherein the computing device has a user, and wherein the identified attribute reflects an aspect of the user.

142. (New) The method of claim 24 wherein one or more applications are executing on the computing device, and wherein the identified attribute reflects an aspect of an executing application.

143. (New) The method of claim 142 wherein an electronic messaging application is among the applications executing on the computing device, and wherein the identified attribute indicates whether new messages have been received by the electronic messaging application.

144. (New) The method of claim 24 wherein the computing device is outside a specified remote environment, and wherein the identified attribute reflects an aspect of the remote environment.

145. (New) The method of claim 24 wherein the computing device has a user, and wherein the identified attribute reflects an aspect of a specified person other than the user.

146. (New) The method of claim 145 wherein the specified person has a location, and wherein the identified attribute is the location of the specified person.

147. (New) The method of claim 24 wherein the identified attribute reflects an aspect of an identified person.

148. (New) The method of claim 24 wherein values for the identified attribute are available from each of a plurality of sources, wherein the invocation request further specifies one of those sources, and wherein the provided value is from the specified source.

149. (New) The method of claim 24 wherein values for the identified attribute are available from each of a plurality of sources, wherein the invocation request further specifies to provide a value of the identified attribute from each of the sources from which a value of the identified attribute is available, and wherein the providing of the value to the requesting attribute consumer further includes providing to the requesting attribute consumer a value of the identified attribute from each of the sources from which a value of the identified attribute is available.

150. (New) The method of claim 24 wherein values for the identified attribute are available from each of a plurality of sources, and wherein the value of the identified attribute that is provided to the requesting attribute consumer is determined based upon the values of the identified attribute available from the plurality of sources.

151. (New) The method of claim 150, further comprising caching the value of the identified attribute provided to the requesting attribute consumer.

152. (New) The method of claim 24 wherein a plurality of values of the identified attribute are available from different sources, and wherein the invocation request further specifies to select one of the plurality of available values of the identified attribute to provide, and wherein the value of the identified attribute provided to the requesting attribute consumer is selected from the plurality of available values of the identified attribute.

153. (New) The method of claim 24 wherein a plurality of values of the identified attribute are available from different sources, and wherein the invocation request further specifies to determine a value of the identified attribute to provide that is based upon the plurality of available values of the identified attribute but different than each of the plurality of available values of the identified attribute, and wherein the value of the identified attribute provided to the requesting attribute consumer is based upon the plurality of available values of the identified attribute but different from each of the plurality of available values of the identified attribute.

154. (New) The method of claim 24 wherein a plurality of values of the identified attribute are available from different sources, and wherein the invocation request further specifies to determine one value from the plurality of available values of the identified attribute to provide, and wherein the value of the identified attribute provided to the requesting attribute consumer is determined from the plurality of available values of the identified attribute.

155. (New) The method of claim 154 wherein the invocation request further specifies a basis for determining one value from the plurality of available values of the identified attribute to provide, and wherein the value of the identified attribute provided to the requesting attribute consumer is determined from the plurality of available values of the identified attribute using the specified basis.

156. (New) The method of claim 155 wherein the available values of the identified attribute are each requested and received from a different source, and wherein the invocation request further specifies selecting the first-received available value of the identified attribute, and wherein the value of the identified attribute provided to the requesting attribute consumer is the first-received available value of the identified attribute.

157. (New) The method of claim 155 wherein the invocation request further specifies soliciting selection by a user of one of the available values of the identified attribute, and wherein the value of the identified attribute provided to the requesting attribute consumer is an available value of the identified attribute selected by the user.

158. (New) The method of claim 24 wherein the invocation request is received by a context characterization module that has an attribute under its control, wherein the invocation request identifies the attribute under the control of the characterization module, and wherein the attribute whose value is provided to the requesting attribute consumer is the attribute under the control of the characterization module.

159. (New) The method of claim 24 further comprising, before the invocation request to provide an attribute value is received, receiving from the attribute consumer an invocation request to register the attribute consumer.

160. (New) The method of claim 159 wherein the invocation request to register an attribute consumer indicates that the requesting attribute consumer reserves an opportunity to later request provision of a value of the identified attribute, the method further comprising associating with the identified attribute an indication that the requesting attribute consumer is dependent on the identified attribute.

161. (New) The method of claim 24 further comprising, before the invocation request to provide an attribute value is received, receiving an invocation request to register an attribute source for the identified attribute, and wherein the method further comprises obtaining a value of the identified attribute from the attribute source with which the identified attribute is associated, and wherein the value of the attribute obtained from the attribute source with which the identified attribute is provided to the requesting attribute consumer.

162. (New) The method of claim 24 wherein the specified maximum age is older than the ages of any values for the identified attribute.

163. (New) The method of claim 24 wherein the specified maximum age is an indication that any age is acceptable.

164. (New) The method of claim 24 wherein the specification of the maximum age in the invocation request is a lack of an indication of an explicit maximum age, and wherein determining whether a value for the identified attribute has an age that is no older than the specified maximum age includes determining that any attribute value age is no older than the specified maximum age.

165. (New) The method of claim 24 wherein the specification of the maximum age in the invocation request is a lack of an indication of an explicit maximum age, and wherein determining whether a value for the identified attribute has an age that is no older than the specified maximum age includes determining that any attribute value age is older than the specified maximum age.

166. (New) The method of claim 24 wherein the specification of the maximum age in the invocation request is a lack of an indication of an explicit maximum age, and wherein determining whether a value for the identified attribute has an age that is no older than the specified maximum age is performed in a manner unknown to the requesting attribute consumer.

167. (New) The method of claim 24 wherein the specification of the maximum age in the invocation request is optional, and wherein determining whether a value for the identified attribute has an age that is no older than the specified maximum age when an explicit maximum age is not specified in the invocation request includes determining whether the attribute value age is no older than a default maximum age.

168. (New) The method of claim 167 wherein the default maximum age is specified by the requesting attribute consumer.

169. (New) The method of claim 167 wherein the default maximum age is a system default.

170. (New) The method of claim 167 wherein the default maximum age is a default provided by a source for the provided attribute value.

171. (New) The method of claim 167 wherein the default maximum age is obtained externally.

172. (New) The method of claim 167 wherein the default maximum age is functionally determined based at least in part on a current context of the computing device.

173. (New) The method of claim 167 wherein the method is performed by a characterization module executing on the computing device, and wherein the default maximum age is functionally determined based at least in part on a current context of the characterization module.

174. (New) The method of claim 167 wherein the default maximum age is functionally determined based at least in part on a current context of the requesting attribute consumer.

175. (New) The method of claim 167 wherein the default maximum age is functionally determined based at least in part on values of one or more derived attributes related to the identified attribute.

176. (New) The method of claim 167 wherein each attribute has a distinct default maximum age.

177. (New) The method of claim 176 wherein the default maximum ages for the attributes are stored in a table that is regularly updated.

178. (New) The method of claim 176 wherein the default maximum ages for the attributes are stored in a table that is dynamically updated.

179. (New) The method of claim 167 wherein the default maximum age is learned.

180. (New) The method of claim 179 wherein the learning is performed based on specifications for maximum age from previous requests.

181. (New) The method of claim 179 wherein the learning is performed based on monitoring values for the identified attribute over time.

182. (New) The method of claim 179 wherein the learning is performed based on monitoring whether an earlier value for the default maximum age was later found to be appropriate.

183. (New) The method of claim 24 wherein the specification of the maximum age includes one or more criteria for determining the maximum age in a manner based upon the provided attribute value.

184. (New) The method of claim 24 wherein the maximum age is determined from a timestamp.

185. (New) The method of claim 24 wherein the maximum age is determined relative to a time when the request was made.

186. (New) The method of claim 24 wherein the maximum age is determined relative to a time when the request was received.

187. (New) The method of claim 24 wherein the maximum age is determined relative to a time when a value for the identified attribute was last supplied.

188. (New) The method of claim 24 wherein the maximum age is determined relative to a time when a value for the identified attribute was last generated.

189. (New) The method of claim 24 wherein the maximum age is based on an absolute time.

190. (New) The method of claim 24 wherein the maximum age is determined relative to a time when the provided attribute value was valid.

191. (New) The method of claim 24 including, before the providing of the value to the attribute consumer, receiving from a source the provided value for the identified attribute and information regarding when the provided attribute value is valid.

192. (New) The method of claim 24 wherein the providing of the identified attribute value includes providing information regarding when the provided attribute value is valid.

193. (New) The method of claim 24 wherein the maximum age is based on when a source for values of the identified attribute was last checked.

194. (New) The method of claim 24 wherein the maximum age is based on when a source for values of the identified attribute was valid.

195. (New) The method of claim 24 wherein the maximum age is based on when values of the identified attribute were last obtained from a source.

196. (New) The method of claim 24 wherein the maximum age is based on an expiration time for the provided attribute value.

197. (New) The method of claim 24 wherein the maximum age is based on a specific time supplied by the requesting attribute consumer.

198. (New) The method of claim 24 wherein the maximum age is represented as a range of ages that are acceptable for an attribute value to be provided.

199. (New) The method of claim 24 wherein the maximum age is represented as a range of ages that are not acceptable for an attribute value to be provided.

200. (New) The method of claim 24 wherein the maximum age is represented as multiple ages.

201. (New) The method of claim 24 including providing a mechanism to functionally determine the maximum age.

202. (New) The method of claim 24 wherein the provided attribute value is derived from information provided by multiple sources, and including determining the age for the provided attribute value.

203. (New) The method of claim 24 wherein the specified maximum age includes indications of multiple criteria.

204. (New) The method of claim 24 wherein the specified maximum age includes criteria for determining the maximum age that vary based on a source of the provided value for the identified attribute.

205. (New) The method of claim 24 including, before the providing of the identified attribute value, determining the value of the identified attribute to be provided, the determining performed in such a manner as to only use attribute values whose age is less than the specified maximum age.

206. (New) The method of claim 24 including, in response to the specified maximum age, generating a new value for the identified attribute to be used as the provided value.

207. (New) The method of claim 24 wherein the providing of the identified attribute value further includes providing one or more indications of information used to generate the provided attribute value.

208. (New) The method of claim 207 wherein the provided indications of the information used to generate the provided attribute value include ages of one or more pieces of the information.

209. (New) The method of claim 24 wherein the provided identified attribute value has an uncertainty that is based at least in part on the age of the value.

210. (New) The method of claim 209 wherein the uncertainty of the value based on the age is determined based upon a table.

211. (New) The method of claim 209 wherein the uncertainty of the value based on the age is determined based upon a functional relationship.

212. (New) The method of claim 209 wherein the uncertainty of the value based on the age is determined based upon historical data.

213. (New) The method of claim 209 wherein the uncertainty of the value based on the age is determined based upon a defined mechanism.

214. (New) The method of claim 213 wherein the defined mechanism is received from the requesting attribute consumer.

215. (New) The method of claim 213 wherein the method is performed by a characterization module executing on the computing device, and wherein the defined mechanism is provided by the characterization module.

216. (New) The method of claim 24 wherein the providing of the identified attribute value further includes providing information as to how the maximum age was determined.

217. (New) A computer-readable medium whose contents cause a computing device to exchange context attributes, by performing a method comprising:

receiving an invocation request from an attribute consumer to provide one or more values of an identified attribute, the invocation request specifying a maximum age for at least one of the attribute values to be provided; and

in response, providing to the attribute consumer at least one value for the identified attribute whose age is no older than the specified maximum age.

218. (New) The computer-readable medium of claim 217 wherein the contents are instructions that when executed cause the computing device to perform the method.

219. (New) A computing device for exchanging context attributes, comprising:
an invocation request receiver configured to receive an invocation request from an attribute consumer to provide one or more values of an identified attribute, the invocation request specifying a maximum age for at least one of the attribute values to be provided; and
an attribute value provider configured to provide to the attribute consumer in response at least one value for the identified attribute whose age is no older than the specified maximum age.

220. (New) The computing device of claim 219 wherein the invocation request receiver and the attribute value provider are part of a characterization module executing in memory of the computing device.